Claims

1. An induction heating system for heating a material, comprising:

a crucible forming a tunnel through which the material travels, the crucible formed substantially from the group of materials consisting of silicon carbides, high resistivity steels and high permeability steels;

an at least one induction coil comprising a cable wound of a plurality of conductors isolated from each other, the at least one induction coil surrounding the crucible;

an electrically and thermally insulating isolation sleeve of low magnetic permeance separating the crucible from the at least one induction coil; and

a means for rotating the crucible.

2. The induction furnace of claim **1** wherein the isolation sleeve comprises a composite ceramic material.

3. The induction furnace of claim **2** wherein the composite ceramic material comprises an air-bubbled ceramic disposed between an at least one inner and an at least one outer layer of ceramic.

4. The induction furnace of claim **1** further comprising a power supply for providing ac power of a selected frequency to the at least one induction coil wherein the depth of penetration into the crucible of a magnetic field generated by a current of the selected frequency in the at least one induction coil is in the range of from half the thickness to the thickness of the crucible.

5. The induction furnace of claim **4** wherein the power supply is mounted adjacent to the at least one induction coil.

6. The induction furnace of claim **5** wherein an air flow sequentially cools the components of the power supply and the at least one induction coil.

7. The induction furnace of claim **1** further comprising a means for advancing the material through the tunnel of the crucible, the means for advancing the material through the tunnel disposed within the interior of the tunnel.

8. An induction heating system for heating a material, comprising:

a substantially enclosed crucible having a sealed first end opening whereby the material can be inserted into the crucible without allowing the interior atmosphere of the crucible to be released and a second sealed end opening whereby the material can be removed from the crucible without allowing the interior atmosphere of the crucible to be released, the crucible formed substantially from the group of materials consisting of silicon carbides, high resistivity steels and high permeability steels;

an at least one induction coil comprising a cable wound of a plurality of conductors

isolated from each other, the at least one induction coil surrounding the crucible;

an electrically and thermally insulating isolation sleeve of low magnetic permeance separating the crucible from the at least one induction coil; and

a means for rotating the crucible to advance the material along the longitudinal length of the crucible.

9. The induction furnace of claim **8** wherein the isolation sleeve comprises a composite ceramic material.

10. The induction furnace of claim **9** wherein the composite ceramic material comprises an air-bubbled ceramic disposed between an at least one inner and an at least one outer layer of ceramic.

11. The induction furnace of claim **8** further comprising a means for advancing the material through the tunnel of the crucible, the means for advancing the material through the tunnel disposed within the interior of the tunnel.

12. The induction furnace of claim **8** further comprising a power supply for providing ac power of a selected frequency to the at least one induction coil wherein the depth of penetration into the crucible of a magnetic field generated by a current of the selected frequency in the at least one induction coil is in the range of from half the thickness to the thickness of the crucible.

13. The induction furnace of claim **12** wherein the power supply is mounted adjacent to the at least one induction coil.

14. The induction furnace of claim **13** wherein an air flow sequentially cools the components of the power supply and the at least one induction coil.

15. A process for heating a material comprising the steps of:

feeding the material through a tunnel formed from a crucible, the crucible substantially comprising a material of high electrical resistivity or high magnetic permeability;

inductively heating the crucible by supplying a current to an at least one induction coil consisting of a cable wound of multiple conductors isolated from each other, the at least one induction coil surrounding the container and being electrically and thermally isolated from the container by an isolation sleeve;

adjusting the frequency of the current so that the depth of penetration into the crucible of the magnetic field generated by the current in the at least one induction coil is in the range of from half the thickness to the thickness of the container; and

rotating the crucible, whereby the material is heated by the conduction of heat from the container to the metal.

16. The process of claim **15** wherein the container is formed substantially from a silicon carbide

or a high permeability steel.

17. The process of claim **15** further comprising the steps of:

providing an ac power supply adjacent to the at least one induction coil to provide the current to the at least one induction coil; and

supplying an air flow sequentially through the power supply and the at least one induction coil to cool the components in the power supply and the at least one induction coil.

18. A process for heating a material comprising the steps of:

sealing the interior of a crucible formed substantially from a material of high electrical resistivity or high magnetic permeability;

inductively heating the crucible by supplying a current to an at least one induction coil consisting of a cable wound of multiple conductors isolated from each other, the at least one induction coil surrounding the crucible and being electrically and thermally isolated from the crucible by an isolation sleeve;

adjusting the frequency of the current so that the depth of penetration into the crucible of the magnetic field generated by the current in the at least one induction coil is in the range of from half the thickness to the thickness of the crucible;

inserting the material into a first end of the crucible without allowing the interior atmosphere of the crucible to be released;

advancing the material through the crucible to heat the material by transfer of heat from the crucible;

removing the material from a second end of the crucible without allowing the interior atmosphere of the crucible to be released; and

rotating the crucible, whereby the material is heated by the conduction of heat from the crucible to the material.

19. The method of claim **18** wherein the crucible is formed substantially from a silicon carbide or a high permeability steel.

20. The process of claim **18** further comprising the steps of:

providing an ac power supply adjacent to the at least one induction coil to provide the current to the at least one induction coil; and

supplying an air flow sequentially through the power supply and the at least one induction coil to cool the components in the power supply and the at least one induction coil.